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U. S. DEPARTMENT OF AGRICULTURE - FOREST SERVICE
CALIFORNIA FOREST AND RANGE EXPERIMENT STATION
Division of Forest Insect Research

FOREST INSECT CONDITIONS
ALAMO MOUNTAIN - LOS PADRES NATIONAL FOREST
APPRAISAL SURVEY
SPRING, 1956

Introduction

An appraisal survey of forest insect conditions on Alamo Mountain, Los Padres National Forest, was completed during the period March 23 to May 17, 1956. In this appraisal an attempt was made to estimate timber mortality due to insects, in two ways: from plots delineated on aerial photographs, and from plots established on the ground. The survey was a cooperative endeavor between the Los Padres National Forest and the Pacific Northwest and the California Forest and Range Experiment Stations. The Forest provided funds for the aerial phases of the project. The Pacific Northwest Station provided the equipment and personnel for the aerial photography. The Station also handled the photo interpretation, ground checking of the aerial photos, and analysis of the aerial phases of the project. The California Station assisted in the photo interpretation and ground checking of the aerial photos, and conducted the ground survey.

The main objectives of the appraisal were to test the efficiency of photographic evaluation of current and recent past mortality in an operational survey, to obtain an estimate of total current and recent past mortality by number of trees and volume per acre, and to produce a map showing the relative degree of current mortality to serve as a guide for possible control action by the Los Padres National Forest.

Personnel participating in the survey included R. B. Pope, J. F. Wear, and W. C. Guy of the Pacific Northwest Forest Experiment Station, and R. C. Hall, G. C. Trostle, B. E. Wickman, J. H. VrMeer, and R. E. Stevens of the California Forest and Range Experiment Station.

The Alamo Mountain Area

The Alamo Mountain area comprises about 7,000 timbered acres ranging in elevation from about 5,500 to 7,500 feet. The mountain is a rugged, isolated remote area accessible only by trail or a very rough jeep road.

Tree species include ponderosa, Jeffrey, sugar, and pinyon pines, white fir, and big-cone Douglas-fir.

Site varies from very poor site 4 on exposed ridges to very good site 2 in protected draws.

Timber type varies with exposure, with ponderosa, sugar, and Jeffrey pine and white fir, listed in terms of their relative abundance, on the north and eastern exposures, while pure Jeffrey pine occurs on southern and western exposures. Big-cone Douglas-fir and pinyon pine are minor species and occur at the timber fringes at lower elevations.

A fire in 1951 burned over about a thousand acres of the very best mixed conifer type in the northwest corner of the area. About 400 acres of timber was killed outright and the balance was injured from fire from light to severe. On the whole, Alamo Mountain contains some of the finest timber in southern California. In its present state of access it has limited recreational use, but with better access it would have important recreational possibilities. Ownership is about 100 percent U. S. Forest Service.

Forest Insect Species

The following forest insect species were found: The western pine beetle, Dendroctonus brevicomis Lec., in ponderosa pine; the mountain pine beetle, D. monticolae Hopk., in sugar pine; the California flatheaded borer, Melanophila californica Van D., in Jeffrey pine; the fir engraver, Scolytus ventralis Lec., in white fir; the roundheaded fir borer, Tetropium abietis Fall, in white fir; the California five-spined engraver, Ips confusus Lec., in pinyon pine and probably in ponderosa; and the Oregon pine engraver, Ips oregoni (Eichh.), in Jeffrey pine. No primary insect species was found in the big-cone Douglas-fir. No Jeffrey pine beetle was found during the course of the survey.

Methods

Two methods were employed in conducting this survey: One was the use of aerial photos, and the other was the conventional method of ground sampling through the use of circular 1/2-acre sample plots which has been in use at the California Station for several years.

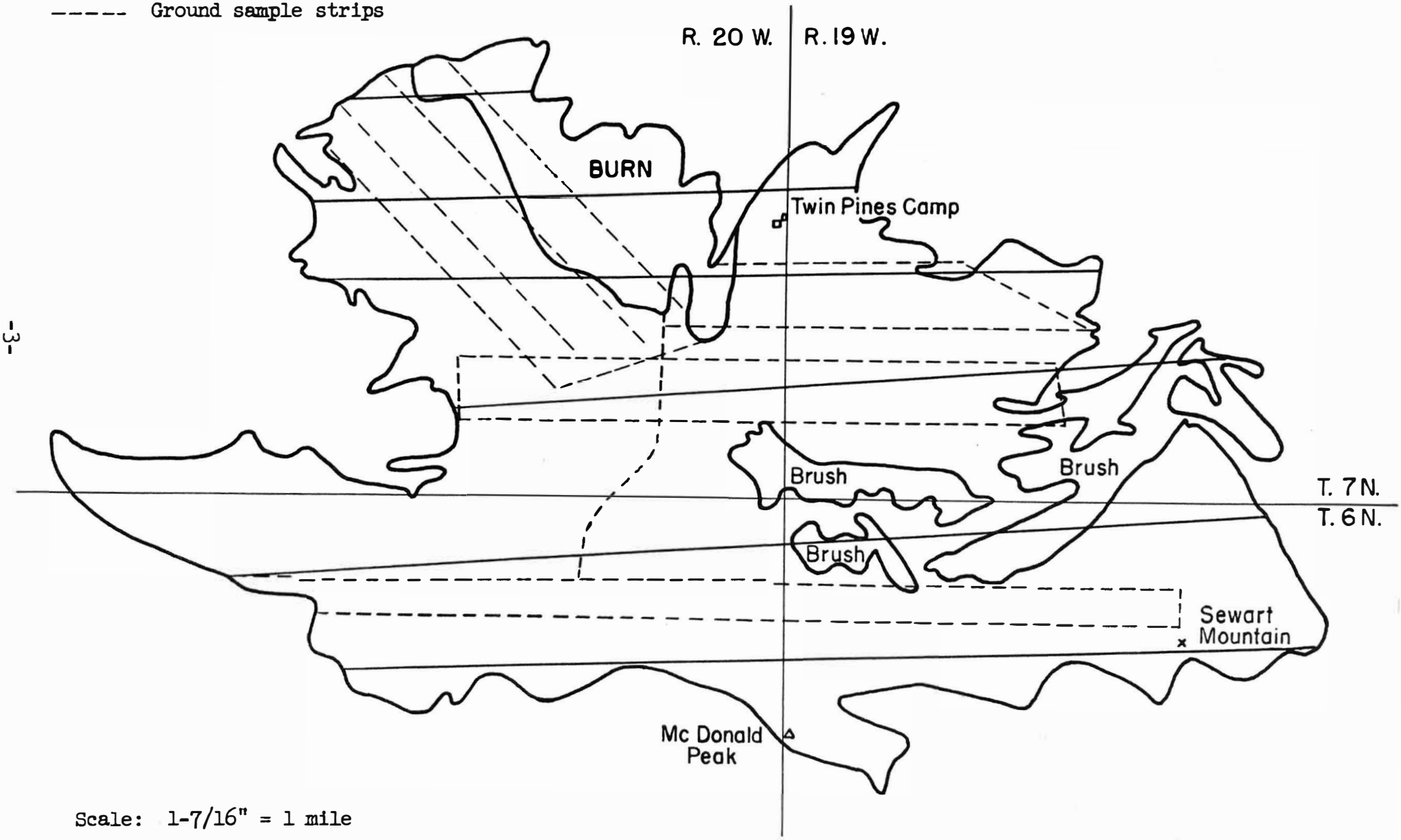
Aerial method.--A joint research project has been under way by the Pacific Northwest and California Stations for several years to test the efficiency of the use of aerial photos to appraise timber loss due to bark beetles in northern California. The present survey was designed to test the results of this research on an operational basis.[1/] Aerial photos were taken by Wear and Guy on March 23 and 24. Current and recent past mortality were subsequently estimated on a series of photo plots. Some of these plots were field checked. Additional details concerning procedures used in the aerial photo test will be covered in a separate report to be prepared by the Pacific Northwest Station.

Ground method.--The ground survey was conducted during the period May 15 to May 17 by Hall, Trostle, and Stevens. The system of sampling consisted of a series of 1/2-acre circular plots established at 5-chain intervals along lines 20 chains apart. The total number of plots was 506, together comprising about 3.6 percent of the area (fig. 1). From past experience it was estimated that this intensity of sampling would yield results subject to a sampling error of less than 25 percent at the 68 percent confidence level.

1/ Pope, R. B. March 1956. Work plan for evaluating the insect-caused mortality on Alamo Mountain Unit, Los Padres N. F., Calif. Pacific Northwest Forest Experiment Station, Portland, Oregon. (Processed)

Figure 1

Sampling System
Alamo Mountain Infestation Area
Los Padres National Forest
Spring 1956



The following information was taken on the plots: current (1955) mortality on trees 5 inches d.b.h. and larger recorded by tree species, diameter, and insect species. The same information was taken for the previous year's mortality (1954). Additional 3-year mortality was taken for trees 11 inches and larger on all ground plots.

Results

The aerial photo method failed completely to provide a satisfactory estimate of current mortality. It was moderately successful, however, for determining recent past mortality. Further details concerning the results obtained by this method will be reported by the Pacific Northwest Station.

The ground survey method was more satisfactory and yielded estimates with much smaller sampling errors than did the aerial method. The results presented here are based on a combination of the data obtained by the two methods. These data are summarized in Table 1. Since the ground method yielded estimates with much lower sampling errors than did the aerial photo method and since greater weight was given to data from this source, these statistics are largely influenced by the ground survey.

Current Mortality (1955).--Current mortality was considered as any tree which had been infested during the 1955 season.

The average number of currently infested trees per acre was 0.139 with a sampling error of 15.1 percent. The volume estimated was 223 board-feet per acre with a sampling error of 19.7 percent. Jeffrey pine made up 78 percent of the total volume killed in this category, and ponderosa pine 22 percent. The diameter breast height of the average tree killed in 1955 was 33.4 inches.

Previous Year's Mortality (1954).--The previous year's mortality was similar to that for 1955 in number of trees killed, but differed considerably in volume loss. The number of trees killed per acre in 1954 was estimated at 0.130 ± 0.022 with a sampling error of 16.9 percent, compared to 0.139 for 1955. The volume estimate for 1954 was 147.4 board-feet per acre ± 33.2 with a sampling error of 22.5 percent. This indicates that the level of loss is not falling off as had been expected.

5-Year Mortality.--Trees considered as falling in the 5-year class were the two previous classes mentioned above, plus sound standing snags with no bark loss and all twigs remaining.

The estimate for the number of trees killed over a 5-year period was 1.851 per acre with a sampling error of 9.2 percent. The volume estimate was 2,510 board-feet per acre with a sampling error of 10.6 percent. The total 5-year mortality was made up of the following species: Jeffrey pine 52%; sugar pine 23%; ponderosa pine 16%; and white fir 9%.

Table 1.--Combined survey data weighted from ground and aerial photo methods on a per-acre basis

	Weighted average	Standard error	Sampling error
Current mortality			
Number of trees	0.139	±0.021	15.1%
Volume board-feet	223	±44	19.7%
Size of dbh average infested tree in.	33.4		
5-Year Mortality			
Number of trees	1.851	±0.171	9.2%
Volume board-feet	2,510	±266	10.6%
Size of average infested tree in.	31.0		

Combined data for whole area - 6,900 acres

Number of currently infested trees	959 ± 145
Volume of infested trees, board-feet	1,538,700 ± 303,100
Number of total trees killed - 5-year period	12,722 ± 1,175
Volume killed, board-feet - 5-year period	17,320,000 ± 1,836,000

Discussion

During the past 5 years the Alamo Mountain area has been depleted of about 17 million board-feet of timber from insect attack. The average volume of timber killed is estimated to have been about 500 board-feet per acre per year. This represents epidemic losses. The current loss (1955) is estimated to have been about 223 board-feet per acre. Although current loss is lower than the 5-year average, it still must be considered epidemic in proportions.

Both current and past losses have not been uniform over the area as a whole. Past losses have been heaviest in the Snow Creek drainage and on the area injured by fire. In some cases it was difficult to precisely determine the trees killed primarily by insects and those killed by fire, but in the survey a serious attempt was made to include only those trees killed by insects and exclude those killed by fire.

The current loss is still heaviest in the burned area, next heaviest in the northwest portion of the area, and lightest in the eastern and southern portions of the area. The relative intensity of current damage is shown in Figure 2.

From the standpoint of priority, in any control program that may be started, the Alamo Mountain area can be broken down into three priority units. The unit most urgently in need of treatment is the burn, which, in terms of relative loss, is shown as heavy (fig. 2). The second priority unit is shown as medium, and takes in generally the northwestern portion of the area. The remainder of the area is of lowest priority; it includes generally the eastern and southern portions, where losses are light.

There are two ways in which insect-caused losses in the Alamo Mountain area can be reduced. One is by initiating a program of direct control. Considering the rugged terrain and lack of access to the area, it is believed that such an undertaking would be difficult and expensive. It is estimated that it would cost more than $50,000 per year to carry on an adequate control program in this area. For such an undertaking to be successful it would need to run for at least 3 years.

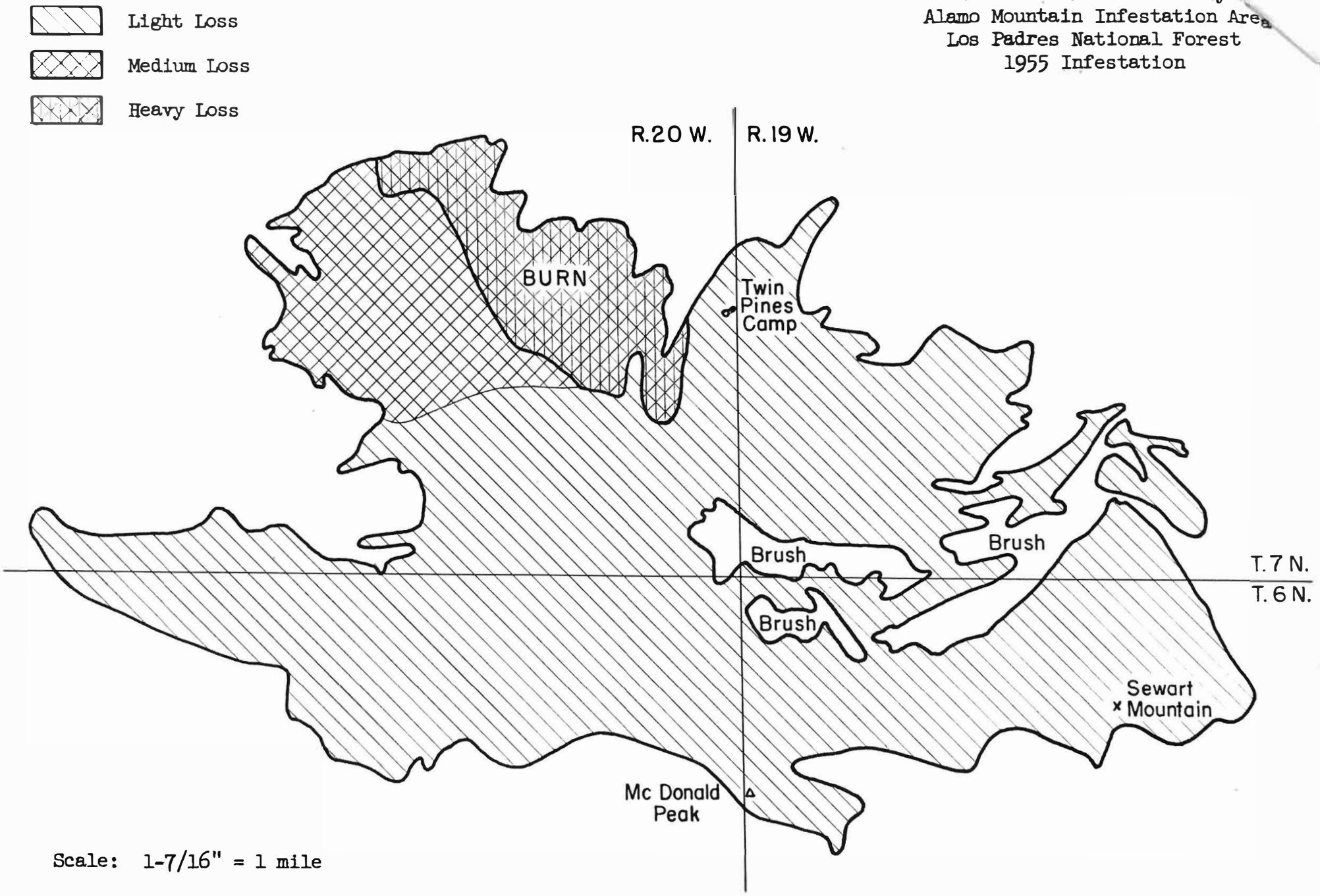
The other alternative would be indirect control through the use of sanitation-salvage logging. Since the major portion of the current loss is occurring in ponderosa and Jeffrey pine, this method of treatment is likely to be very effective in materially reducing losses for an extended period. In order to achieve maximum benefits from a sanitation-salvage program, the logging should be followed by a maintenance control program. Infested trees should be logged out or treated as they show up following the initial treatment.

Berkeley, California
July 18, 1956

Ralph C. Hall
Entomologist

Figure 2

Relative Loss Intensity
Alamo Mountain Infestation Area
Los Padres National Forest
1955 Infestation



Scale: 1-7/16" = 1 mile